Do pore water solutes affect juvenile bivalve burial behaviour?

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Introduction

Climate change models predict an increase in both the frequency of extreme rainfall and the supply of terrigenous sediment to coastal waters. A better understanding of how this supply affects coastal ecosystems has become important for coastal managers world wide.

Here, we describe an experiment designed to investigate how thin deposits of terrigenous sediment (TSD) affect the burial behaviour of juvenile bivalve recruits. Our experiment builds on a study by Cummings et al. (2009) that revealed evidence for a link between changes in the bacterial activity in the TSD-underlying sediment and the behaviour of the recruits on the surface of the TSD: reduced end products of the anaerobic microbial decomposition of organic matter diffused upwards across the TSD informing the recruit about poor substrate suitability.

To test this model, we will study the burial behaviour of juvenile *Macomona liliana* (**Figure 1**) in a laboratory seawater flume.

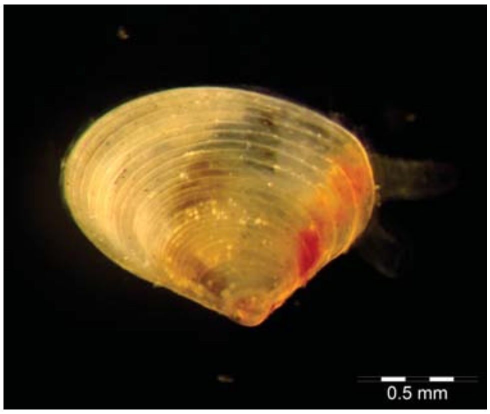

Figure 1. Post-settlement juvenile of the tellinid bivalve *Macomona liliana*.

Hypothesis

We hypothesize that post-settlement juvenile *Macomona liliana* will not bury into organic-rich coastal sediment onto which terrigenous sediment was deposited. They will bury, however, when encountering terrigenous sediment deposited onto organic-matter free, diagenetically inactive sediment.

Design

We will conduct four experimental runs. In each run, we will place 20 post-settlement juvenile *Macomona liliana* onto the surface of four sediment cores inserted through the bottom of the flume. The cores will be positioned in a line perpendicular to the flume flow (**Figure 2**). Each core represents one sediment treatment and each treatment will be tested in each core position (see **Figure 3**). To create 1–2 mm thin TSD, terrigenous sediment collected from a land slide in the Te-Whanganui-A-Hei Marine Reserve will be suspended in seawater and then added to a tube placed over the sediment core.

Post settlement juveniles of *Macomona liliana* (**Figure 1**, 1–2 mm shell length) will be placed on the surface of the sediment cores and their burial behaviour documented with photographs and video.

Microprofiles of oxygen concentration, redox potential, and pH will be measured with microelectrodes to investigate the effects of the clay deposits on the pore water chemistry.

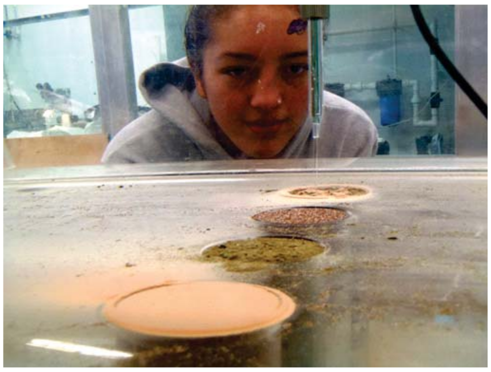

Figure 2. Photograph showing the bottom of a recirculating flume through which four sediment cores have been inserted. The pH microelectrode in the background is attached to a motorised micromanipulator for vertical profiling of the sediment–water interface.

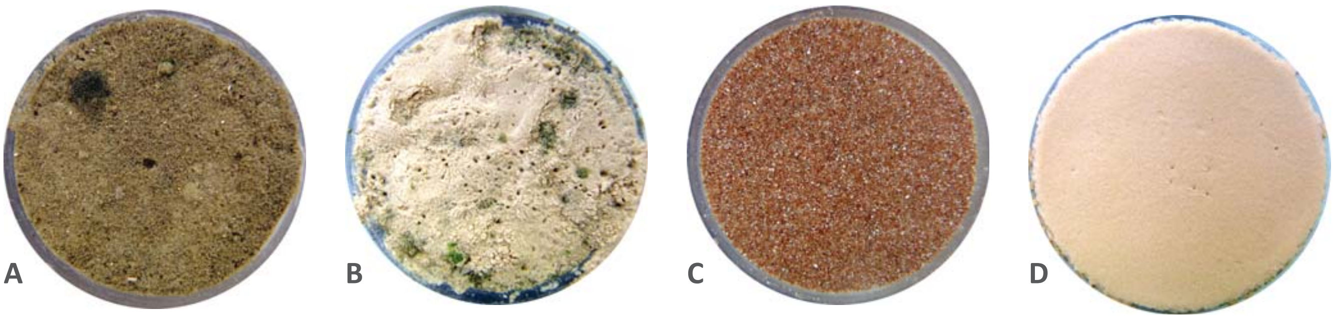

Figure 3. Sediment treatments. (**A**) Natural (control) sediment, (**B**) natural sediment with a thin (1–2 mm) surface deposit of terrigenous sediment (TSD), (**C**) inactive sediment, and (**D**) inactive sediment with a thin (1–2 mm) TSD. Notice that the TSD on the surface of the sediment core in (**B**) has been disturbed by benthic macrofauna. The inactive sediment in (**C**) and (**D**) is devoid of organic matter.

References

Cummings VJ, Vopel K, Thrush SF (2009) Terrigenous deposits in coastal marine habitats: influences on sediment geochemistry and behaviour of post-settlement bivalves. Marine Ecology Progress Series 383:173–185

The Ministry of Science and Innovation and the Faculty of Health and Environmental Science of Auckland University of Technology will fund this research through a Te Tipu Putaiao Fellowship (contract TTP AITX1001) and a post graduate fees scholarship.

Acknowledgements